Limitations of computed tomography in leaking abdominal aortic aneurysms

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Computed tomography cannot predict whether an aneurysm is the cause of abdominal pain or whether rupture is imminent

Computed tomography (CT) has greatly facilitated the non-invasive assessment of abdominal aortic aneurysms. CT is an effective and accurate method of establishing the presence of an aneurysm and measuring its maximum diameter¹⁻³; it can also define the cranial and caudal extent.⁴ Patients whose abdominal aortic aneurysms are leaking may present as an emergency with vague abdominal pain and backache but without any concomitant tenderness, hypotension, or history of collapse.⁵⁻⁷ Where the facility exists CT may be used to determine whether the aneurysm in such a patient has leaked or not, as it is capable of detecting very small quantities of blood in the retroperitoneal tissues.⁸ Nevertheless, though the investigation inevitably establishes the state of the tissues at the time of examination and may occasionally identify thinning of the aneurysm wall,⁹ it cannot predict imminent rupture of an aneurysm.

We report six patients in whom a palpable, symptomatic abdominal aortic aneurysm leaked soon after urgent CT had shown no leak and examine the implications of using CT in these patients.

Present series

Between July 1985 and July 1987 six patients with abdominal aortic aneurysms were admitted as emergency cases to Addenbrooke's Hospital or the

Ipswich Hospital with mild abdominal pain and backache but no history of collapse or hypotension. All had a palpable abdominal aneurysm but in only one was slight tenderness elicited initially. Urgent abdominal CT in all patients confirmed the presence of an infrarenal aneurysm, the maximum diameters of the aneurysms ranging from 5.3 cm to 10.0 cm (table). In no patient was a leakage identified, though in case 1 a fortuitous second scan 28 minutes later (after administration of intravenous contrast medium) showed extensive haemorrhage which had occurred in the interim (fig 1). This man was immediately transferred for emergency surgery, but though the aneurysm was repaired, he died the next day.

The remaining five patients had their operations deferred, partly because of the reassuring CT results. In one of these patients (case 2) the aneurysm ruptured on the evening of admission, 11 hours after CT, and despite prompt surgical intervention the patient died on the operating table. In retrospect a small amount of intra-abdominal fluid was present in the scan; it was thought to be ascites but should have been interpreted as retroperitoneal blood (fig 2). One patient (case 3), who had a renal transplant which was still functioning, developed increased pain and tenderness over his aneurysm five hours after CT and received a successful emergency repair with the use of a pump oxygenator to maintain perfusion of his renal transplant via the

Details of patients with abdominal aortic aneurysms and CT images

Case No	Age (years)	Sex	CT findings	Time delay to operation	Operative findings	Outcome
1	71	M	5 cm Aneurysm. No leak initially. Massive leak 28 minutes later	90 min	Leaking	Repaired. Died
2	74	M	8.5 cm Aneurysm. No leak. ?Intraperitoneal fluid	11 h	Ruptured	Died at operation
3	52	M	7 cm Aneurysm. No leak	4 h 45 min	Leaking	Repaired. Alive and well
4	72	F	6.7 cm Aneurysm. No leak	4 h 30 min	Leaking. Recurrent carcinoma	No repair. Died from aneurysm
5	63	M	7.3 cm Aneurysm. No leak	22 h	Large anterior leak	Repaired. Alive and well
6	65	M	10 cm Aneurysm. No leak	25 h	Leaking	Repaired. Alive and well

FIG 1—Case 1. Left: Initial CT image showing aneurysms of 5 cm diameter, normal retroperitoneal tissue planes, and no leak. Ring of calcium internal to aneurysmal margin was probably calcium on edge of thrombus (aortic dissection may cause similar appearance). Right: CT image 28 minutes later (after evaluation of thoracic aorta for possible dissection) showing massive collection of high attenuation material in left posterior pararenal space consistent with rupture. Rupture confirmed at operation 90 minutes later

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FIG 2—Case 2. CT scan showing 8.5 cm aneurysm. Fluid in retroperitoneal tissues (arrowed) misinterpreted as intraperitoneal fluid. Fluid shows appearance of high attenuation on left, though Hounsfield numbers not available. (High attenuation virtually diagnostic of leakage)

femoral vessels; at operation a posterior leak was discovered. In case 4 a woman who had had an anterior resection for carcinoma of the rectum 10 months previously developed increasing abdominal pain and distension and had an emergency laparotomy four and a half hours after CT. Extensive recurrence of peritoneal tumour was discovered along with a small posterior leak from the aneurysm. No repair was undertaken and she died four days later; at necropsy recurrent tumour was confirmed and the aneurysm had ruptured. The single patient with abdominal tenderness initially (case 5) developed increased abdominal pain and tenderness 20 hours after CT; emergency laparotomy disclosed an extensive anterior leak from his aneurysm, which was successfully repaired. In case 6 a man with continuous back pain received elective repair of his aneurysm 25 hours after CT and a small posterior leak was discovered.

Discussion

Patients with symptomatic abdominal aortic aneurysms but no clinical evidence of leakage present both a diagnostic challenge and a dilemma in management. Tender, pulsatile abdominal masses are usually diagnosed as abdominal aortic aneurysms, though other lesions may masquerade as such.¹⁰⁻¹² The use of arteriography,¹³ superseded by ultrasound¹⁴ and CT,¹⁵ has resulted in more accurate diagnosis of such masses. CT accurately delineates the extent of

abdominal aneurysms and in an emergency more reliably establishes the presence or absence of a leak than does ultrasound.¹⁴ Unfortunately, the potentially lethal condition of "rapidly expanding aneurysm" cannot be diagnosed by CT without previous ultrasonic or CT data. Similarly, CT cannot predict whether an aneurysm is necessarily the cause of abdominal pain, nor whether rupture is imminent.

The results of elective surgery for abdominal aortic aneurysms, both in patients with symptoms and in those without, are much better than after emergency surgery,⁷ and the absence of a detectable leak on CT may prompt a surgeon to defer operation and plan an elective repair.⁵ Our series shows the potential danger associated with this policy, and we suggest that failure to detect a leak on CT should not be the sole justification for delaying surgery in any patient with a symptomatic abdominal aortic aneurysm greater than 5 cm diameter whose symptoms suggest recent expansion.

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